Two new species of silver mallet (*Eucalyptus* – Myrtaceae) of very restricted distribution in south-western Western Australia.

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Abstract

Nicolle, D. Two new species of silver mallets (*Eucalyptus* – Myrtaceae) of very restricted distribution in south-western Western Australia. *Nuytsia* 15(1): 77–83 (2002). *Eucalyptus rugulata* Nicolle *sp. nov.* is described from the South Ironcap–Hatter Hill area north-east of Lake King, distinguished within the silver mallets by its broad and thick adult leaves and the large and robust buds and fruits. *E. purpurata* Nicolle *sp. nov.* is described from a single population near Bandalup Hill east of Ravensthorpe. It is distinguished from *E. argyphea* L.A.S. Johnson & K.D. Hill by the conspicuous red-purple new growth and the smaller buds and fruits. Both new species are of restricted distribution and *E. purpurata*, in particular, is considered to be at risk. A key and distribution map for the silver mallets are presented.

Introduction

The two new species described here belong to *Eucalyptus* series *Falcatae* Brooker & Hopper. They were unknown or poorly known until recently, probably because of their limited natural distribution, and also, in the case of *E. rugulata*, because of a lack of knowledge regarding the application of the names *E. argyphea, E. ornata* Crisp and *E. recta* L.A.S. Johnson & K.D. Hill. These five species are obligate seeders and together are known as the silver mallets.

Eucalyptus rugulata was first collected by Charles Gardner in 1929 at Hatter Hill. Gardner (1960) subsequently recognised the Hatter Hill population as a robust variant of *E. falcata* showing tendency towards *E. goniantha*. Gardner illustrated three forms of *E. falcata*, including his specimens from Hatter Hill which are representative of *E. rugulata*. All the silver mallets were included with *E. falcata* (a resprouter species) at the time of Gardner's treatment of *E. falcata*.

Eucalyptus purpurata is a much more recent discovery, first collected in 1994, despite its distinctive field appearance.

The two new species are published as a matter of priority because of their conservation status. Being obligate seeders they could be eliminated by frequent wildfire over their relatively small geographical range. They occur in areas undergoing extensive mining exploration and active mining, and populations of both species are under threat from such activities in the short term.

Taxonomy

The classification and distinguishing features of silver mallets within *Eucalyptus* are as follows (modified from Brooker 2000).

Eucalyptus subg. *Symphyomyrtus* (Schauer) Brooker – cotyledons folded in seeds; buds bi-operculate; seeds with ventral or terminal hilum; seed coat formed from both integuments.

Eucalyptus sect. *Bisectae* Maiden ex Brooker – cotyledons bisected; inflorescences axillary.

Eucalyptus subsect. *Destitutae* Brooker – pith of branchlets without glands.

Eucalyptus ser. *Falcatae* – mallees or mallets; leaf venation closely pinnate, tertiary venation finite; oil glands numerous, intersectional; inflorescences single in axils; inflexed staminal filaments with all anthers fertile; ovary roof not lobed.

Silver mallets – obligate seeders, lignotuber absent (mallets).

A group of five species restricted to the south-west of Western Australia as shown in Figure 1.

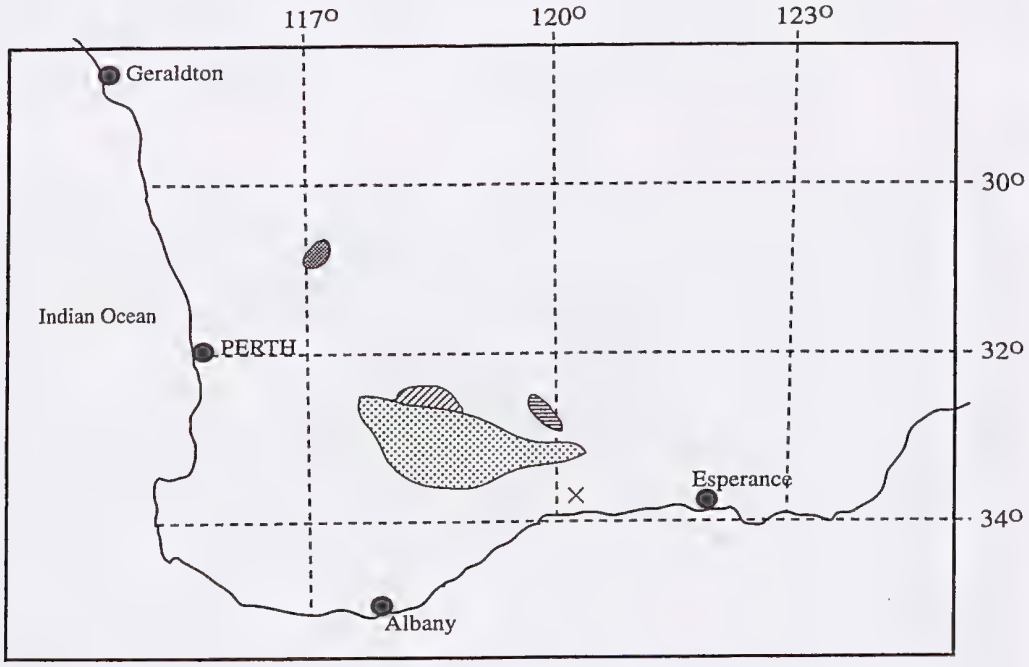

Figure 1. Map of the south-western part of Western Australia showing distribution of *Eucalyptus argyphea* ⊡ , *Eucalyptus ornata* ▨ , *Eucalyptus purpurata* × , *Eucalyptus recta* ▩ , *Eucalyptus rugulata* ▤ .

Key to the silver mallets of *Eucalyptus* ser. *Falcatae*

1. Buds (hypanthium and operculum) and fruits sharply ribbed longitudinally ..... **E. ornata**
1. Buds and fruits smooth to broadly or irregularly ribbed
2. Fruit up to 8 mm diam., < 8 mm long; buds up to 7 mm wide
3. Leaves, branchlets and buds yellow green to reddish-green, crown dark green; buds > 15 mm long, at least 5 mm wide ..... **E. argyphea**
3. Leaves, branchlets and buds distinctly red-purple, crown purple-green; buds < 14 mm long, < 5 mm wide ..... **E. purpurata**
2. Fruit > 8 mm diam., 8–11 mm long; buds at least 8 mm wide
4. Fruit 8–9 mm long, broader than long; adult leaves 11–16 mm wide ..... **E. recta**
4. Fruit 9–11 mm long, equal-dimensional or longer than broad; adult leaves 16–28 mm wide ..... **E. rugulata**

Eucalyptus rugulata Nicolle, *sp. nov.*

Affinis *Eucalypto rectae* sed foliis adultis latioribus et crassioribusque, fructibu longioribus, longioribus quam latioribus, cupulatis vel doliiformis et alabastris fructibusque irregulariter costatis distinguitur.

Typus: Digger Rocks, 3 km south of Varley turnoff on Forrestania road, 32°43'48"S, 119°49'12"E, Western Australia,11 November 2000, *D. Nicolle* 3672 *& M. French* (*holo:* PERTH; *iso:* CANB).

Illustration. Gardner (1960: 6, Figures C–F).

Tree (mallet: obligate seeder) to 12 m tall. *Lignotuber* absent. *Bark* smooth throughout, fully decorticating in short longitudinal strips, somewhat glossy, dark grey to grey over silvery grey to pale tan-cream. *Branchlets* with pith glands absent. *Cotyledons* bisected. *Seedling leaves* initially ± opposite, shortly petiolate, linear; becoming disjunct, distinctly petiolate, broadly ovate to elliptical, slightly discolorous, dull, slightly blue-green, to 25 mm long and 15 mm wide. Seedling stem weakly square (TS) with scattered raised glands. *Adult leaves* disjunct; lanceolate to broad-lanceolate; concolorous, glossy to highly glossy, green to dark green; reticulation moderately dense to dense; oil glands sparse, island and intersectional; petiole 18–25 mm long, lamina 80–140 mm long, 16–28 mm wide. *Inflorescences* axillary, unbranched, 7–11-flowered; peduncles angular to flattened (TS), slightly distally broadened, 14–18 mm long; pedicels slightly angular (TS), 7–13 mm long. *Flower buds* pendulous, 15–20 mm long, 8–9 mm wide, hypanthium coarsely ribbed, cupular to cylindrical; operculum conical/horn-shaped, almost smooth to coarsely ribbed. *Flowers* cream to very pale creamy yellow; stamens inflexed, all fertile; anthers versatile, basifixed, opening by lateral slits. *Fruit* pendulous, tapering to pedicel, (truncate-globose to) cupular to barrel-shaped, 9–11 mm long, 8–11 mm wide, almost smooth to coarsely ribbed (ribs to 2 mm high). *Operculum scar c.* 2 mm wide, level to slightly ascending; staminophore prominent. *Disc c.* 2 mm wide vertically descending. *Valves* (3)4, exserted and fused at tips by persistent, fragile style remnants, breaking off to rim level with age. *Seeds* ovoid, slightly glossy, grey-brown, reticulation dense, 2–2.8 mm long. (Figure 2A)

Specimens examined. WESTERN AUSTRALIA: NE and at base of South Ironcap hill on Forrestania–Southern Cross road, 32°40'33'S, 119°46'41"E, 6 Nov. 1999, *M. French* 1085 (PERTH); Hatter's [Hatter] Hill, Nov. 1929, *C.A. Gardner s.n.* (PERTH); on northern side of gridline, *c.* 25 m NE of South Ironcap Trig, 32°40'46"S, 119°46'29"E, 7 Sep. 1996, *N. Gibson & K. Brown* 3142 (PERTH); NE of

Figure 2. Holotypes. A – *Eucalyptus purpurata*; B – *E. rugulata*.

gridline junction, 70 m S of haul road around minesite, *c.* 800 m WSW of Digger Rocks, 32°43'52"S, 119°48'24"E, 6 Sep. 1996, *N. Gibson & K. Brown* 3143 (PERTH); in NE junction of gridlines, *c.* 1 km SW of South Ironcap, 32°41'14"S, 119°46'16"E, 8 Sep. 1996, *N. Gibson & K. Brown* 3184 (PERTH); 7.6 km E of RPF on Varley–Southern cross road, 1 Sep. 1988, *K. Hill* 3052 (CANB, NSW, PERTH); Hatter Hill area, *c.* 90–100 m NNE of Hatter Hill trig, 85 km N of Ravensthorpe, 32°49'44"S, 119°58'55"E, 26 May 1990 *H. Mollemans* 2710 (CANB, PERTH); *c.* 30 km S of Lake Cronin crossroads towards South Ironcap (eastern slope of South Ironcap) 32°40'45"S, 119°46'49"E, 11 Nov. 2000, *D. Nicolle* 3671 *& M. French* (AD, CANB, PERTH); summit of Hatter Hill, 32°49'39"S, 119°58'56"E, 11 Nov. 2000, *D. Nicolle* 3673 *& M. French* (AD, CANB, PERTH); South Ironcap, 3 Sep. 1970, *K.R. Newbey* 3290 (PERTH).

Distribution and habitat. Distributed from South Ironcap south to Hatter Hill, east of Varley (NNE of Lake King) in south-western Western Australia, over a linear range of approximately 26 kilometres. *E. rugulata* occurs on locally high hills consisting of orange lateritic gravel, often in more or less pure stands, but also associated with various other eucalypts such as *E. rigidula* Maiden, *E. livida* Brooker and Hopper, *E. densa* Brooker and Hopper subsp. *densa*, *E. phenax* Brooker and Slee subsp. *phenax* and *E. olivina* Brooker and Hopper.

Flowering period. Recorded in flower in November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Four. Although the species is known from a restricted range, it is relatively common in locally higher and more rocky landscapes. Mining exploration in its area of occurrence indicates future mining activity may pose a

threat to the species. As the Hatter Hill area is poorly surveyed botanically, there is the possibility further populations may be found, increasing the species range.

Etymology. From the Latin *rugula* (wrinkle, corrugation) referring to the large fruits that become distinctly wrinkled upon drying (but are not sharply ribbed), and also referring to the broken, rugged sites in which the species grows in comparison to surrounding land forms.

Affinities. Closest to *Eucalyptus recta* L.A.S. Johnson & K.D. Hill, distinguished by the broader and thicker adult leaves; the more cupular to barrel-shaped, longer, equal-dimensional fruits (depressed-hemispherical, 8–9 mm long, and broader than long in *E. recta*) and the broadly and irregularly ribbed buds and fruits (± smooth in *E. recta*).

Notes. Hill & Johnson (1992) cited a specimen (*Mollemans* 2710), of what is here considered to be *E. rugulata*, as an intergrade between *E. ornata* and *E. argyphea*. *Eucalyptus rugulata* has larger buds and fruits than either *E. ornata* or *E. argyphea*, and occurs geographically to the north-east of both species, indicating the populations are not intergrades. Furthermore, *E. rugulata* forms large and morphologically consistent populations at its three known localities (viz. South Ironcap, Digger Rocks and Hatter Hill). *E. ornata* and *E. argyphea* are known to intergrade in the area south and west of Hyden, and are the only two species of silver mallets known to naturally interbreed (e.g. 5.3 km N from Pingaring Varley road on Alymore Rd, 32°42'54"S, 118°53'04"E, 15 July 2001, *D. Nicolle* 3815 *& M. French*, PERTH).

Eucalyptus purpurata Nicolle, *sp. nov.*

Affinis *Eucalypto argypheae* sed foliis novis, ramulis alabastrisque puniceis et alabastris fructibusque minoribus distinguitur.

Typus: near Bandalup Hill, east of Ravensthorpe, 33°40'07"S, 120°24'03"E, Western Australia, 5 November 2000, *D. Nicolle* 3579 *& M. French* (*holo:* PERTH; *iso:* AD, CANB, NSW).

Tree (mallet: obligate seeder) to 10 m tall, with new growth (leaves, branchlets and buds) conspicuously red-purple. *Lignotuber* absent. *Bark* smooth throughout, fully decorticating in short longitudinal strips, dull, light grey over cream. *Branchlets* without pith glands, purple-red when new. *Seedling stems* slightly square (TS), with very scattered raised glands. *Cotyledons* bisected. *Juvenile leaves* initially opposite, shortly petiolate, linear; becoming disjunct, distinctly petiolate, elliptical, slightly discolorous, dull, slightly blue-green, to 28 mm long and 10 mm wide. *Adult leaves* disjunct; lanceolate; concolorous, glossy, maturing dark olive green; reticulation moderately dense; oil glands sparse, intersectional; petiole 13–17 mm long, lamina 45–95 mm long, 6–15 mm wide. *Inflorescences* axillary, unbranched, 7–11-flowered; peduncles terete to slightly angular (TS), 7–15 mm long; pedicels terete, 3–6 mm long. *Flower buds* pendulous, 11–13 mm long, 4–4.5 mm wide, hypanthium slightly ribbed; operculum conical/horn-shaped, smooth, slightly narrower to slightly broader than hypanthium at join. *Flowers* cream; stamens inflexed, all fertile; anthers versatile, basifixed, opening by lateral slits. *Fruit* pendulous, distinct from pedicel, truncate-globose to flattened-hemispherical, 5–6 mm long, 6–7 mm wide, ± smooth (somewhat wrinkled when dry). *Operculum scar* < 1 mm wide, level. *Disc c.* 1 mm wide, vertically descending. *Valves* 3, exserted and fused at tips by persistent, fragile style remnants, breaking off to rim level with age. *Seeds* ovoid, 2–2.4 mm long, slightly glossy, grey-brown, reticulation fine. (Figure 2B)

Specimens examined. WESTERN AUSTRALIA: Bandalup Hill, 30 km E of Ravensthorpe, Dec. 1997, *G. Cockerton & S. Skull* 3899 (PERTH); Bandalup Hill, *c.* 31 km ENE of Ravensthorpe, 33°39'53"S, 120°24'01"E, 18 Feb. 1998, *G.F. Craig* 3622 (PERTH); Bandalup Hill, E of Ravensthorpe, 33°39'56"S, 120°23'55"E, 22 Nov. 1999, *M. French* 1101 (PERTH); type locality, 5 Nov. 2000, *D. Nicolle* 3580 *& M. French* (AD, CANB, PERTH); E side of Bandalup Hill near Jerdacuttup, 1994, *P. White s.n.* (PERTH).

Distribution and habitat. Known from a single population south-east of Bandalup Hill, between Ravensthorpe and Jerdacuttup, in south-west Western Australia. It grows on the eastern and north-eastern slopes of a broad ridge of white, magnesite-influenced powdery loam. *E. purpurata* mainly occurs in a more or less pure stand with an understorey dominated by *Melaleuca haplantha* and *Leptomeria pachyclada.* Downslope, *E. indurata* Brooker & Hopper and *E. pleurocorys* L.A.S. Johnson & K.D. Hill are associated with the new species.

Flowering period. Recorded in flower in November 2000.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. The single known population covers approximately 18 hectares (45 acres). Aerial surveys have been carried out in the area specifically to survey for further populations (G. Craig pers. comm.), but no more populations have been found. The species should be considered for inclusion on Western Australia's schedule of Declared Rare Flora, having been subject to intensive surveys. Mining and poor fire management (high fire frequency) are considered to be the main threats. Locality data have not been masked in this publication as the plants are large and produce abundant viable seeds, thus collection of specimens or seed are not considered to be a threat to the species.

Etymology. From the Latin *purpuratus* (purple) referring to the distinctive and diagnostic red-purple new growth (leaves, branchlets and buds).

Affinities. Closest to *Eucalyptus argyphea* L.A.S. Johnson & K.D. Hill, readily distinguished in the field by its intensely purple-red new foliage, branchlets and buds (yellow-green to pale red-green in *E. argyphea*), giving the crown a dark purple-green aspect. Herbarium specimens of *E. purpurata* without any new growth can be distinguished from *E. argyphea* by their smaller buds and fruits (buds 16–21 mm long and 5–7 mm wide, fruit 6–8 mm long and 5–7 mm wide in *E. argyphea*).

Notes. Eucalyptus purpurata is highly distinctive in the field due to its crown of purplish new growth, and appears to have remained undiscovered until relatively recently due to its limited distribution. The population cannot be seen from any roads with the exception of Jerdacuttup West Rd, just west of Jerdacuttup, where part of the population is visible approximately six kilometres to the north-west. Initial cultivation trials at Currency Creek Arboretum (South Australia) indicate the purplish new growth is retained when the species is grown outside its natural habitat.

Molecular data support the description of *E. purpurata* as a distinct taxon. Using Amplified Fragment Length polymorphisms (AFLP), S. Krauss (unpub. data) assessed variation both within *E. purpurata* and between *E. purpurata* and the more widespread *E. argyphea.* The study indicated high levels of genetic diversity within *E. purpurata* and found that *E. purpurata* is significantly genetically distinct from *E. argyphea.*

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